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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/970,071	10/03/2001	John F. Ranta	B-26	9065

21253 7590 03/23/2004  
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EXAMINER

SAADAT, CAMERON

ART UNIT	PAPER NUMBER
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3713

DATE MAILED: 03/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/970,071

Applicant(s)

RANTA ET AL.

Examiner

Cameron Saadat

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

In response to amendment filed 12/19/03, claims 1-32 are pending in this application.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1, 3, 6, 9, 10, 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayka et al. (USPN 5,688,118; hereinafter Hayka)**

Regarding claim 1, Hayka discloses a method for simulating dental procedures for training dental students comprising, the steps of: employing a digital computer consisting of a processor and a display 72 device to display a model of a tooth, employing said digital computer and display device to display a model of a dental tool (See Fig. 4, refs. 90, 88), and employing a haptic interface device including a force-feedback stylus 52 that is manually moveable by a dental student and coupled to said digital computer 70 and 80 to move the model of a dental tool with respect to said model of a tooth, and employing the digital computer to calculate and apply interaction forces to the force feedback stylus to simulate the feel of the dental tool to haptically simulate a dental procedure (Col. 6, lines 33-48, 62; Col. 10, lines 47-59).

Regarding claim 3, Hayka discloses a simulated dental procedure wherein the dental tool is a drill 54 having a hand piece 52 movable by said dental student to simulate the motion of said handle.

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Regarding claim 6, Hayka discloses a simulated dental procedure wherein said model of a dental tool is selected by said student from a plurality of available dental hand tools, each of which has a handle 52, and wherein said haptic interface includes a hand piece 52 movable by said dental student to simulate the motion of the handle of each of said dental hand tools (Col. 12, lines 34-40).

Regarding claim 9, Hayka discloses a simulated dental procedure wherein said display device renders said model of a tooth and said model of a dental tool in a stereoscopic three dimensional display (Col. 8, lines 5-6).

Regarding claim 10, Hayka discloses a simulated dental procedure wherein said a haptic interface device that is manually moveable by a dental student includes a moveable hand piece that is moveable in at least three degrees of freedom (Col. 6, line 45).

Regarding claim 12, Hayka discloses a simulated dental procedure wherein said model of a tooth is subdivided into different regions simulating different materials said materials including enamel, dentin and pulp (Col. 10, lines 25-42).

Regarding claim 13, Hayka discloses a simulated dental procedure wherein said model of a dental tool represents a drill, said method further including the step of removing portions of said model of a tooth that are intersected by said drill (Col. 10, lines 60-67).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 2-4, 7-8, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayka et al. (USPN 5,688,118; hereinafter Hayka).**

Regarding claims 2-4, 7-8, 14, Hayka discloses a simulated dental procedure wherein the dental tool is a drill 54 having hand piece 52 movable by said dental student to simulate the motion of the handle by providing force feedback. Hayka does not explicitly disclose that the dental tool is a pick (as per claim 2, 7, 8), amalgam carrier (as per claim 4, 8, 14), or carver (as per claim 5, 7, 8). However, Hayka discloses a system that would enable simulation of various dental procedures such as cavity preparations, crown preparations, root canal preparations, and all other performances carried out by means of the dental hand piece and/or hand tools, including a chisel, an angle former, and enamel hatchet. Hayka further discloses amalgam parameters and several other parameters that are programmed into the system to simulate force feedback and image simulation for training a dental student (Col. 12, lines 10-40). Hence, it would have been obvious to a person of ordinary skill in the art to modify the dental hand piece 52 described in Hayka, by simulating various dental hand tools required for performing various dental procedures such as cavity preparations, crown preparations, root canal preparations, and all other

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performances carried out by means of the dental hand piece and/or hand tools, including a chisel, an angle former, and enamel hatchet.

**Claims 11, 15-18, and 19-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayka et al. (USPN 5,688,118; hereinafter Hayka) in view of Arnold.**

Regarding claims 11, 15-18, Hayka discloses all of the claimed subject matter with the exception of not explicitly disclosing that the model of the tooth is volumetrically rendered. However, Arnold discloses a virtual dental training system wherein a model of a tooth is volumetrically rendered (See 4.2). Hence, at the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the rendering of the tooth model described in Hayka, by providing volumetric rendering, in light of the teachings of Arnold, in order to provide a higher quality image, thereby enhancing the reality of the simulation.

Regarding claim 19, Hayka discloses an apparatus for simulating dental procedures for training a dental student comprising, in combination, a digital computer 70 consisting of at least a processor, a display device 72, a haptic interface including a moveable hand piece 52 manipulated by said student, and storage means for storing: data for representing a tooth as a collection elements in three-dimensional space, tool definition data for representing the shape and character of a modification region of a dental tool in three-dimensional space, and a simulation program executable by said processor in response to the movement of the handle for moving a displayed model of the dental tool with respect to a displayed model of the tooth and for calculating and applying interaction forces to the force-feedback stylus to simulate the feel of the dental tool to haptically simulate a dental procedure (Col. 6, lines 33-48, 62; Col. 8, line 5; Col. 10, lines 47-59).

Regarding claim 21, Hayka discloses an apparatus for simulating dental procedures wherein the storage means further stores tool definition data specifying the characteristics of said dental tool including shape information (Col. 10, lines 3-5; see Fig. 4, ref. 90)

Regarding claims 22 and 29-31, Hayka discloses an apparatus for simulating dental procedures wherein said tool definition data specifies the shape and location of a modification region of said dental tool and wherein said simulation program includes means for modifying said object (Col. 5, lines 5-10).

Regarding claim 23-24, 32, Hayka discloses an apparatus for simulating dental procedures wherein said simulation program further includes means for modifying elements and feel points for controlling haptic forces applied to the handle wherein the dental tool is moved near the tooth (Col. 10, lines 60-67).

Regarding claim 25, Hayka discloses an apparatus for simulating dental procedures wherein at least some of said feel points define the location of a handle portion of said dental tool (Col. 9, lines 10-15).

Regarding claims 26 and 27, Hayka discloses an apparatus for simulating dental procedures wherein at least some of said feel points are positioned to increase (as per claim 26), or decrease (as per claim 27) the amount of force that the student must apply to the handle to modify data representing said tooth (Col. 2, line 62 – Col. 3, line 12).

Hayka discloses all of the claimed subject matter of claims 19-32, with the exception of not explicitly disclosing that the model of the tooth is volumetrically rendered including storing grid data and specifying volumetric attributes. However, Arnold discloses a virtual dental training system wherein a model of a tooth is volumetrically rendered (See 4.2). Hence, at the

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time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the rendering of the tooth model described in Hayka, by providing volumetric rendering, in light of the teachings of Arnold, in order to provide a higher quality image, thereby enhancing the reality of the simulation.

***Response to Arguments***

Applicant's arguments filed 12/19/03 have been fully considered but are not persuasive.

Applicant emphasizes that Hayka does not disclose a haptic interface device including a force-feedback stylus to which a digital computer applies calculated interaction forces to simulate the feel of a modeled dental tool. However, it is noted by the examiner, that Hayka clearly discloses a force-feedback hand piece 52 to which a digital computer 80 applies calculated interaction forces to simulate the feel of a modeled dental tool (Col. 10, lines 47-59).

It is further asserted by the applicant, that Hayka merely uses an actual drill to provide force feedback and does not use a haptic interface device including a force-feedback stylus to which a digital computer applies calculated interaction forces to simulate the feel of a modeled dental tool. The examiner notes that Hayka discloses a haptic interface device including a force-feedback stylus 52 to which a digital computer 80 applies calculated interaction forces to simulate the feel of a modeled dental tool (Col. 10, lines 47-59).

Additionally, applicant indicates that Hayka merely suggests providing a handle that provides position data to a computer to simulate various dental hand tools, and asserts that there is no suggestion in Hayka to provide force feedback to the hand piece 52. However, Hayka does disclose interface controller 80 for applying calculated interaction forces to the hand piece 52 (Col. 10, lines 47-59). Hayka further discloses a system that would enable simulation of various



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dental procedures such as cavity preparations, crown preparations, root canal preparations, and all other performances carried out by means of the dental hand piece and/or hand tools, including a chisel, an angle former, and enamel hatchet. Hayka additionally discloses amalgam parameters and several other parameters that are programmed into the system to simulate *force feedback* and image simulation for training a dental student (Col. 12, lines 10-40). Hence, it would have been obvious to a person of ordinary skill in the art to modify the dental hand piece 52 described in Hayka, by simulating various dental hand tools required for performing various dental procedures by providing force feedback and image simulation to various dental tools required for dental procedures, such as cavity preparations, crown preparations, root canal preparations, and all other performances carried out by means of the dental hand piece and/or hand tools, including a chisel, an angle former, and enamel hatchet.

Applicant further asserts that Hayka does not disclose the use of feel points and does not describe the calculation and application of haptic forces. However, Hayka clearly discloses the use of feel points and using interface controller 80 to provide calculation and application of haptic forces (Col. 10, lines 47-59).

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cameron Saadat whose telephone number is 703-305-5490. The examiner can normally be reached on M-F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Teresa J Walberg can be reached on 703-308-1327. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1148.

CS

  
Teresa Walberg  
Supervisory Patent Examiner  
Group 3700